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PROGRESS AND PROBLEMS IN DEVELOPING B-164105
NUCLEAR AND OTHER/EXPERIMENTAL TECHNIQUES 4/2/74
FOR RECOVERING NATURAL GAS/IN THE
ROCKY MOUNTAIN AREA - ATOMIC ENERGY COMMISSION
DEPARTMENT OF THE INTERIOR - FEDERAL POWER COMMISSION

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This report provides information on the Government's efforts to develop various experimental techniques for recovering natural gas in the tight geological formations in the Rocky Mountain area. Information presented covers economic, technical, and environmental aspects of nuclear stimulation, massive hydraulic, and chemical explosive techniques.

Development of nuclear stimulation, involving the detonation of nuclear explosives in a wellbore, has been funded for a total of more than \$33 million by the Atomic Energy Commission over the last 10 years. Nuclear stimulation experiments have shown that gas recovery from tight formations can be significantly increased using the technique.

Development of massive hydraulic fracturing, involving the injection of fluid under pressure to crack or fracture the tight formations, had not received Federal funding before fiscal year 1974. Because experiments using this technique have not been conducted in the Rocky Mountain area its feasibility for use in that area is uncertain.

Chemical explosives fracturing involves detonating chemical explosives in wellbores to enlarge existing cracks in the earth. Between fiscal years 1968 and 1973 about \$380,000 of Federal funds

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was spent to develop this technique. Experiments with chemical explosives fracturing have not been successful. Two attempts by private firms to use this technique have resulted in fatal accidents.

A Federally-funded task force found that massive hydraulic fracturing could generally recover gas at a lower cost than nuclear stimulation. Our analysis of the task force comparison showed that if the nuclearly-created fractures closed over time, the cost advantage of the massive hydraulic technique would increase. Whether fractures created in the nuclear stimulation experiments are or have closed, is an issue that has not yet been resolved.

To recover the gas from the Rocky Mountain area would require programs consisting of:

- for nuclear stimulation, drilling 5,680 wells and
detonating 29,680 nuclear explosives
- for massive hydraulic fracturing, drilling about
22,720 wells.

In addition to the problem of whether nuclearly-created fractures close, the feasibility of carrying out these programs could be affected by two other problems.

The first problem is whether using nuclear stimulation would hinder underground mining of oil shale, which is located in some of the same areas as the gas. The Department of the Interior believed that nuclear stimulation would hinder oil shale mining while AEC said that its studies showed that proper design and

planning should render the concurrent recovery of gas and oil shale compatible.

The second problem is whether the arid Rocky Mountain area contains enough water to support using massive hydraulic fracturing and the development of other mineral resources, such as coal and oil shale. Interior agreed with us that a study was needed to resolve this question but, because such a study would be costly, it should not be started until more definitive information was available on water requirements.

Because of the predominant energy-related aspects of these three problems involving the interests of various Federal agencies, we referred them to the Administrator, Federal Energy Office, who could provide Federal leadership in determining the need and type of action called for to resolve these problems and thereby help increase energy production.

The report also contains other information which could be important in determining the feasibility and desirability of a commercial program using nuclear stimulation. The information relates to:

- The effects on homes, buildings, and persons near the underground detonations.
- The effects of nuclear-stimulated gas on man.
- The releases of radioactivity to the atmosphere.

--The disposal of contaminated water separated from
nuclear-stimulated gas.

--AEC's capacity to produce the needed nuclear
materials.

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RESEARCH AND DEVELOPMENT

Federal programs to develop nuclear and other
experimental techniques to recover natural gas

AEC

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